

WHAT IS CLAIMED IS:

1 1. A method for treating a surface of a substrate plate under irradiation
2 of ultraviolet ray emitted from a dielectric barrier discharge lamp, said
3 method comprising the steps of:

4 removing oxygen on and in the vicinity of a treating surface of said
5 substrate plate;

6 supplying humidified inert gas toward said substrate plate to humidify
7 said treating surface and surrounding atmosphere of said substrate plate;
8 and

9 irradiating said treating surface of said substrate plate with ultraviolet
10 ray from said dielectric barrier discharge lamp.

1 2. A method for treating a surface of a substrate plate as defined in
2 claim 1, wherein oxygen is removed from said treating surface of said
3 substrate plate by blasting thereto an inert gas or a humidified inert gas.

1 3. A method for treating a surface of a substrate plate as defined in
2 claim 1, wherein said inert gas is nitrogen gas.

1 4. A method for treating a surface of a substrate plate while being
2 transferred horizontally across a treating chamber under irradiation of
3 ultraviolet ray emitted from a dielectric barrier discharge lamp, said method
4 comprising the steps of:

5 removing oxygen or air on and in the vicinity of a treating surface of
6 said substrate plate by blasting a sweeping inert gas thereto from a direction
7 opposite to substrate transfer direction;

8 supplying a water vapor-containing humidified inert gas obliquely
9 toward said substrate plate in a forward direction in said substrate transfer
10 direction to humidify said treating surface and surrounding atmosphere of
11 said substrate plate; and

12 irradiating said treating surface of said substrate plate with ultraviolet
13 ray from said dielectric barrier discharge lamp thereby cracking water vapor
14 into a reductive active member [H·] and an oxidative active member [·OH] for
15 reaction with contaminant substances on said treating surface.

1 5. An apparatus for treating a surface of a substrate plate under
2 irradiation of ultraviolet ray, said apparatus comprising:

3 a treating chamber provided in part of a path along which a substrate
4 plate is transferred horizontally by a conveyer means, said treating chamber
5 being provided with a dielectric barrier discharge lamp for irradiating
6 ultraviolet ray on a treating surface of said substrate plate;

7 a humidified inert gas feed means located at a position upstream of an
8 irradiating region of said dielectric barrier discharge lamp in substrate
9 transfer direction thereby to supply a humidified inert gas toward said
10 treating surface of said substrate plate; and

11 an oxygen removing means located at a position upstream of said

12 humidified inert gas feed means in said substrate transfer direction for
13 removing oxygen from said treating surface and surrounding atmosphere of
14 said substrate plate.

1 6. An apparatus for treating a surface of a substrate plate as defined in
2 claim 5, wherein said dielectric barrier discharge lamp is installed in a closed
3 lamp house having on the bottom side thereof a ultraviolet ray irradiating
4 window fitted with a glass pane.

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1 7. An apparatus for treating a surface of a substrate plate as defined in
2 claim 5, wherein said dielectric barrier discharge lamp is installed in a lamp
3 house having an open window on the bottom side thereof for irradiating
4 ultraviolet ray therethrough.

1 8. An apparatus for treating a surface of a substrate plate as defined in
2 claim 5, wherein said humidified inert gas feed means comprises a wet
3 nitrogen gas injecting nozzle projected into said treating chamber and
4 adapted to spurt water vapor-containing humidified nitrogen gas toward said
5 treating surface of said substrate plate obliquely from above and in a forward
6 direction in said substrate transfer direction.

1 9. An apparatus for treating a surface of a substrate plate as defined in

2 claim 5, wherein said oxygen removing means comprises a dry inert gas
3 injection nozzle located in the vicinity of an entrance opening of said treating
4 chamber and adapted to blast a dry inert gas on said treating surface of said
5 substrate plate obliquely from above and in a direction opposite to said
6 substrate transfer direction.

1 10. An apparatus for treating a surface of a substrate plate as defined
2 in claim 9, further comprising upper and lower suction boxes provided on the
3 upper and lower side of said path of transfer of said substrate plate and
4 immediately on the outer side of said entrance opening of said treating
5 chamber.

1 11. An apparatus for treating a surface of a substrate plate as defined
2 in claim 5, wherein said oxygen removing means comprises an air injection
3 nozzle located in the vicinity and on the outer side of an entrance opening of
4 said treating chamber and adapted to blast dry air on said treating surface of
5 said substrate plate obliquely from above and in a direction opposite to said
6 substrate transfer direction.